

National Aeronautics and Space Administration



# Ares Project Overview – Quality in Design

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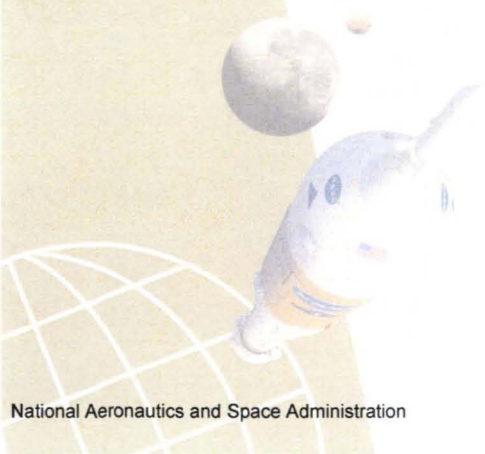




# Agenda



- ◆ **Project Overview**
- ◆ **Testing Strategy**
- ◆ **Project Status**
- ◆ **Quality in Ares Design**





# Ares Project Introduction



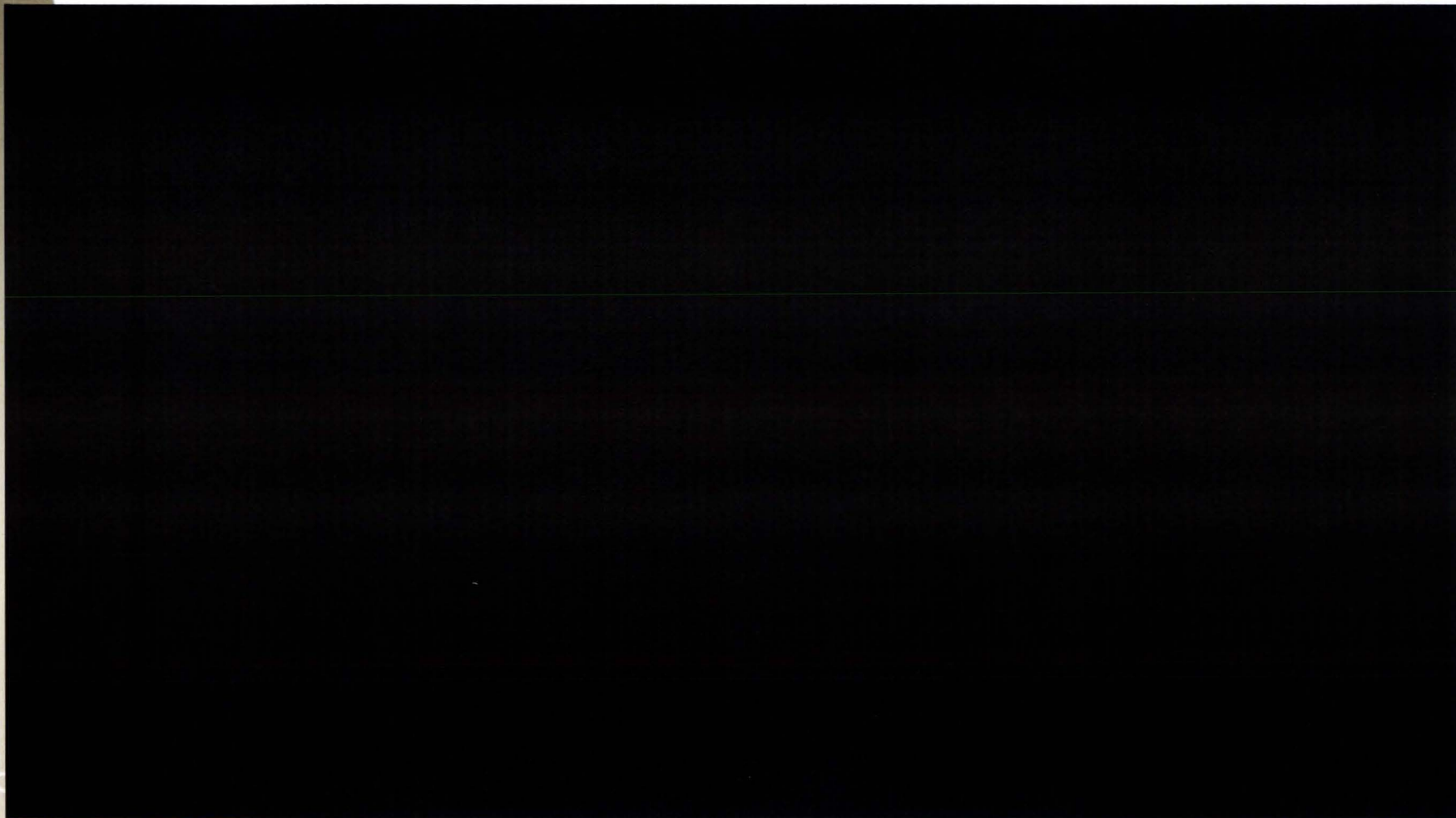
- ◆ The next chapter in human space exploration—Moon, Mars and beyond
- ◆ Building on experience from 50 years of Saturn and Shuttle ops
- ◆ Exploration Systems Architecture Study (ESAS) established requirements
- ◆ U.S. Space Exploration Strategy
  - Complete the International Space Station
  - Retire the Shuttle
  - Develop and fly the Crew Exploration Vehicle (Orion)
  - Explore and establish an outpost on the Moon
  - Send humans to Mars
- ◆ Separate crew and cargo launch vehicles





# Video: Moon and Beyond

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# Ares Project Status



**First Stage Nozzle  
Process Simulation Article**



**J-2X Powerpack Testing**



**Fabricating Gore  
Dome Panels for Upper Stage**



**Over 4,000 Hours of  
Wind Tunnel Testing**





# Testing Strategy



- ◆ **“Test as you fly” strategy**
- ◆ **Ground, flight, and orbital tests**
- ◆ **Ares I-X**
  - April 2009
  - Suborbital flight test
  - Combination of operational and mockup hardware
  - Demonstrate ability to control Ares I vehicle
- ◆ **Additional Ares tests**
  - Ares I-Y: First flight of five-segment RSRB
  - Orion 1: First flight of J-2X and Orion
  - 2015: First crewed flight to International Space Station
  - 2018: First flight of Ares V



# Lean, Kaizen, Six Sigma, and Other Best Practices in Ares Design



- ◆ **Applied Lean practices to Ares I-X flight test organization and schedule margins**
- ◆ **Instituting Lean and Kaizen practices throughout the Ares Project**
  - Creating Lean success stories
  - Using Kaizen to improve operational and business practices
  - Using Kaizen to develop new operational and business processes
- ◆ **Using Six Sigma experiment design to develop and improve Ares upper stage production practices**
- ◆ **Establishing team norms to model appropriate behavior within Ares and S&MA**





# S&MA in Ares Design – Summary

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- ◆ **Providing more resources to support Ares design work**
- ◆ **Making S&MA more independent for objective assessments**
- ◆ **Improving discipline expertise as well as training and mentoring opportunities for new employees**
- ◆ **Adding value through Failure Mode Effect Analyses (FMEAs)**
- ◆ **Improving system safety**
- ◆ **Getting involved in quality up front using Lean, Six Sigma, and Kaizen practices**
- ◆ **Receiving respect for technical expertise**
- ◆ **Becoming an organization where NASA's best and brightest want to work**
- ◆ **Bringing unique engineering expertise to the table in support of programs and projects**





# Questions?

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